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(54) **Hinge with snap-type opening and closing movement**

(57) The present invention relates to a hinge wherein a pair of articulated quadrilaterals, secured to the door (A) and to a wall (P) of a piece of furniture respectively have some elements in common.

The hinge has a spring (20) associated to one of the articulated polygons (4, 5, 6, 7; 3, 8, 9, 10) exerting a

force upon the opening and closing conditions of the door (A), greater than at least that exerted in intermediate conditions.

Thus it is sufficient to apply the elastic means (20) only at one point in order to achieve the snap-type opening and closing of the door (A), simplifying the hinge and reducing the costs.

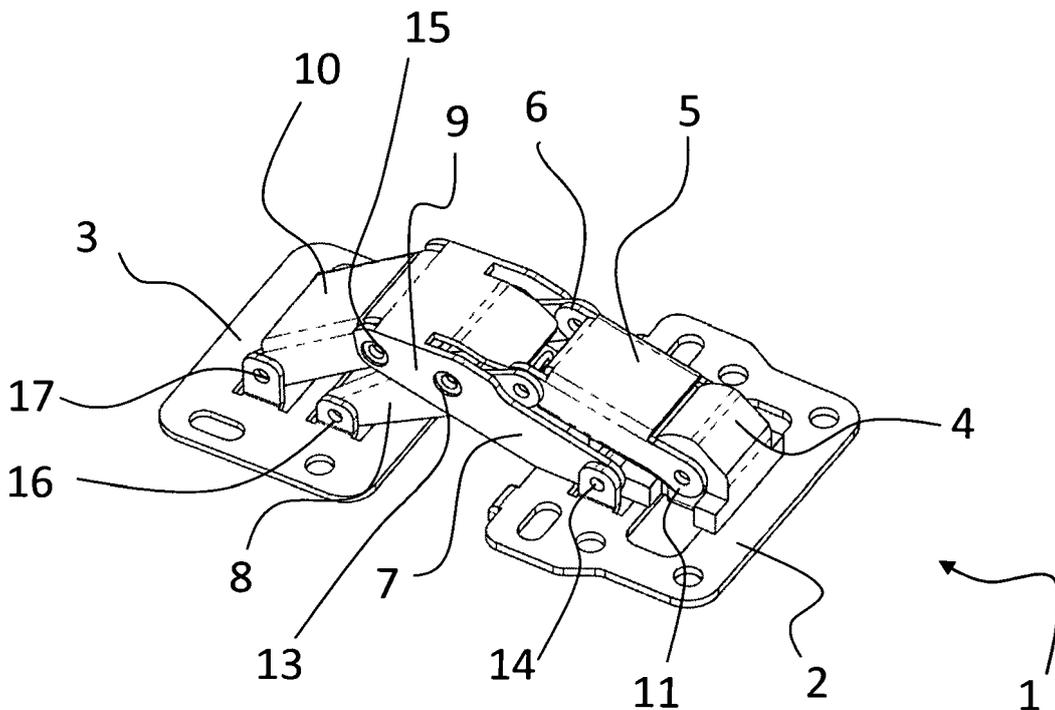


Fig. 3

Description

[0001] The present invention, in its most general aspect, relates to articulated hinges with snap-type movement in the opening and closing phases.

[0002] Such movement is used for keeping hinge-supported doors more firmly in the opening and closing conditions; the use of this type of hinges is known above all for applications where furniture (wardrobes, hanging cabinets, etc) is installed in environments subject to shocks and vibrations, such as road transport means (vehicles, vans, trailers, caravans and the like), boats and so on.

[0003] Hinges of the type mentioned above allow the cabinets to be opened or closed by rotating the door by about 90° with respect to a horizontal axis, such to bring it in a opened and raised condition, leaving it in such condition even in case of small shocks or vibrations due to the movement of the vehicle where the cabinet is located. Usually for such applications hinges different than those intended for home furniture are used, since they must have small dimensions as the spaces available on vehicles, and therefore on wardrobes, are usually quite limited; however at the same time hinges have to provide a force suitable for supporting the weight of the door even in the opened condition such as a door leaf, in addition to keeping it firmly closed in spite of the shocks and vibrations to which a transport vehicle can be subjected. Therefore the hinges to which the present invention particularly relates, have mechanisms composed of articulated polygons (quadrilaterals and the like) secured to a door and to a wall of the piece of furniture, connected to each other by elements in common, such as connecting rods, rocker arms or the like.

[0004] These hinges have been known for a long time and an example can be found in the European patent EP 1138857, where an hinge is described whose snap movement opening and closing the door is the result of the action of two springs acting on respective articulated quadrilaterals that compose the hinge; while as regards the efficiency of the opening and closing phases of the door of the piece of furniture such hinge provides satisfactory performances, the provision of two springs one of which in addition provided outside the hinge mechanism, is a limit both as regards hinge costs, and as regards safety aspects of the mechanism. It can be appreciated that the provision of a spring outside the hinge mechanism is an element of possible interference with the hands of the users opening and closing the cabinet door.

[0005] With reference to this aspect an improvement is represented by the hinge produced by the present applicant and described in its Italian patent application MI2010A001429, figures 1 and 2 of the drawings annexed to this description being taken therefrom.

[0006] This application describes a hinge with no springs outside the hinge mechanism, namely arranged outside the assembly of levers and other elements con-

stituting the articulated quadrilaterals, by the use of an insert 19' that under the elastic action of some springs 21' housed therein, allows a pivot 17' to be engaged which helps in stabilizing the configuration of the hinge in the opened and closed condition of the door.

[0007] As already explained, this hinge avoids providing springs outside the hinge (as in EP 1138857) with the advantages that derive therefrom; however, the use of an insert 19' and of elastic means 21' cooperating with the other elements of the hinge in order to guarantee the performances required by the latter, is an aspect that requires an additional cost as regards the production, with reference both to its manufacturing per se, and with reference to the general assembling of the hinge.

[0008] The technical problem at the base of the present invention is to provide a snap-type articulated hinge of the type mentioned above, which has such structural and functional features to overcome the drawbacks set forth above.

[0009] That is to say, the present invention provides to make a hinge with a snap-type movement which has a structure simplified with respect to the known hinges, at the same time achieving improved performances as regards the opening and closing movements, suitable for hinges for furniture intended particularly but not exclusively for transport means in general such as vehicles, caravans, vans, boats and the like. The idea solving the problem set forth above, is to make a hinge with elastic means that mainly act upon the opening and closing conditions of the door, such to guarantee such conditions to be reliably maintained, however without exerting a significant force in conditions intermediate between these two extreme ones.

[0010] Thus it is possible to use only one spring or anyway simplified elastic means, thus with the possibility of preferably applying them only at one of the articulated polygons or of the articulation mechanisms; therefore a hinge made according to the invention does not need high elastic forces and therefore it does not need springs with performances higher than those of the springs usually used in the known hinges. The characteristics of the hinge according to the invention are specifically set forth in the claims attached to this description; such characteristics, the effects deriving therefrom and the advantages generally achieved by the present invention, will be more clear from the description of a preferred but not exclusive embodiment given herein together with some possible variants, with reference to the annexed drawings wherein:

figures 1 and 2 are a hinge according to the prior art; figure 3 is a perspective view of a hinge according to the invention;

figure 4 is a plan view of the hinge of fig. 1;

figures 5 and 6 are a side view of the hinge of figures 3 and 4 in the respective operative closing and opening conditions of a door;

figure 7 is a partially sectional side view, of the hinge

according to the invention of the previous figures; figure 8 is a diagram showing the trend of the force as a function of the opening angle, exerted by the spring used in the hinge according to the invention; figures 9 and 10 are respective comparative diagrams of the operation of the hinge according to the invention, compared to that of a known hinge; figures 11 and 12 are respective variants of the hinge of the previous figures.

[0011] With reference to the drawings just considered and in particular to figures 3 to 8, a hinge according to the invention is generally denoted by 1, which is of the snap-type with two articulated quadrilaterals having some elements in common.

[0012] The hinge 1 has two fastening plates 2 and 3 intended to be secured (by means of screws) to a wall P and to the door A respectively of a piece of furniture, such as a hanging cabinet or the like; generally two hinges are provided for mounting the door and the opening and closing movements of the door occur by means of a rotation with respect to a horizontal axis (that is perpendicular to the plane of the sheet).

[0013] The door is raised and lowered likewise a door leaf for being opened and closed; however what is described below shall be considered as valid also if the axis of rotation of the door is vertically arranged.

[0014] Moreover, as it can be seen in this case with the door in the closed condition corresponding to the one in fig.5, the plates 2 and 3 of the hinge 1 are arranged perpendicularly each other, while with the door in the open condition (shown in fig.6) they lie substantially coplanar to each other.

[0015] A base 4, better described below, is integral with the plate 2, which represents the frame or fixed side of an articulated quadrilateral and that comprises two rocker arms 5 and 7 connected to each other by a connecting rod member 6, which is the end portion of one of the rocker arms 8 of the second articulated quadrilateral of the hinge.

[0016] In fact, even the second quadrilateral comprises two rocker arms 8, 10 connected by a connecting rod member 9 composed of a portion of the rocker arm 7, and the plate 3 represents the last side thereof; since the connecting rod member 9 is a portion of the rocker arm 7 of the first quadrilateral, it is clear that the two quadrilaterals have some elements in common which connect them kinematically to each other. Therefore, to summarize, the first quadrilateral comprises the base 4, the rocker arms 5, 7 and the connecting rod member 6, articulated at the vertex pivots 11, 12, 13 and 14; the second quadrilateral comprises the rocker arms 8, 10 and the connecting rod member 9, articulated at the vertex pivots 13, 15, 16 and 17.

[0017] While up to now the structure of the hinge 1 is substantially similar to that of the known hinge shown in figures 1 and 2, on the contrary it has to be pointed out as for the rest it is different therefrom as the base 4 co-

operates with elastic means 20, according to the invention.

[0018] The latter in this example are composed of a spring housed into the usual telescopic enclosure known for such applications (see EP 1 138 857); however different elastic means can be provided, such as those obtained by elastomeric members instead of the spring, or in combination thereto.

[0019] The spring 20 cooperates in such a manner to cause the hinge to stop with a snap action in the opening and closing conditions of the door A of the piece of furniture; concerning this it has to be pointed out how in the hinge 1 of the invention only one of the articulated quadrilaterals is associated to the elastic means 20, such to simplify the overall structure of the hinge and consequently, its assembling.

[0020] To this end the base 4 has a projecting head 22, shaped with a cam profile 23 faced outwardly of the hinge and a concave seat 24 in the part faced inwardly.

[0021] The spring 20 during the opening and closing phases of the hinge 1, cooperates with the head 22 such to exert an elastic force on the quadrilateral articulated with the base 4, since it is integral with the first rocker arm 5 and it is articulated at the vertex 12 of the quadrilateral having the articulation pivots 11, 12, 13 and 14.

[0022] Particularly, according to the invention, the shape and the dimensions of the head 22 and those of the elements of the articulated quadrilaterals, namely the base 4, the rocker arms 5, 7 and the connecting rod member 6 for one quadrilateral, and the plate 3, the rocker arms 8, 10 and the connecting rod member 9 for the other quadrilateral, are such that the elastic force exerted by the spring 20 has a substantially constant trend in a prevalent central part of the rotation of the hinge 1, while it increases at the extremes upon the opening and closing conditions.

[0023] This situation can be better understood by figures 8-10 of the drawings, that graphically show the operation of the hinge described above.

[0024] In particular, fig.8 is a diagram where the abscissa shows the opening angle of the hinge (for convenience purposes the condition of the hinge in the several steps is shown under the diagram), while the ordinate shows the elastic force exerted by the spring (that in practice is proportional to the deformation of the spring according to the known Hooke's Law).

[0025] As it can be seen, the trend of the force reaches the maximum value with the door in the opened condition, namely for an angle of about 90°; from the diagram it can be appreciated how such value is about 2,5 times higher than that of the force exerted by the spring at the central opening (or closing) area of the hinge; this allows the door to remain firmly opened, even in case of shocks or vibrations such as those that may affect furniture on vehicles.

[0026] The passage from the maximum value of the force to the central mean one occurs after rotating the hinge lower than 20°, namely a short range so that for

the prevalent part of the rotational movement of the hinge, the force necessary to open or close it is little significant. Moreover one have to consider that in the opening phase it is necessary also to overcome the door weight, that on the contrary is concordant with the force to be applied in the closing phase.

[0027] The force exerted by the spring after its deformation however increases upon the closing condition of the door, as it can be seen in the left area of the diagram; this allows the door to be kept firmly closed, preventing it from being undesirably opened due to accidental reasons.

[0028] However one can understand that in order to keep the door in the closed condition it is sufficient to have a force lower than that necessary for keeping it in the opened condition, since it is not necessary to bear the weight of the door; as a result values 1,3-1,5 times greater than the intermediate ones are suitable for this purpose, as shown in the diagram of fig.8.

[0029] The fact of having a force lower than that of the opening condition is advantageous, since it prevents the spring to be stressed too much; thus, moreover, an excessive force is not necessary for opening the door, such that the cabinet opening phase is facilitated.

[0030] The change in the force applied by the spring 20 is mainly due to the cam mechanism composed of the profile 24 of the head 22, cooperating with the spring 20; the seat 23 in addition gives stability to the door closing condition, since it is engaged by the spring 20 when reaching such condition.

[0031] Figures 9 and 10 show diagrams showing in an enhanced comparative manner the behaviour of the hinge 1 according to the invention and that of a prior art hinge as those mentioned above, with the door in the opening and closing conditions respectively.

[0032] As it is shown in fig. 9, in order to open the hinge 1, when it is closed, a force greater than that of the known hinge is exerted: this means that the door will be kept closed in a more firm manner, thus reducing the risk of undesirable opening in case of shocks and vibrations.

[0033] The force for opening the door, that in the hinge 1 is determined by the cam mechanism composed of the spring 20 and the profile 24, takes a maximum value after few degrees of rotation (about 10°), that is very lower than that of the known hinge.

[0034] As a result in order to open a door supported by the hinges of the invention, a lower force must be applied by the user, such that with reference to this aspect the advantages achieved by the invention are clear.

[0035] It has to be mainly noted the shift between the angles at which the force peak occurs: in the case of the invention it occurs after a rotation half about the case of the known hinge, whose force values remain higher than those of the hinge 1 for a great part of the opening phase, thus uselessly requiring a higher force by the user.

[0036] Similar considerations are also valid as regards the door closure. The force applied when the latter is completely opened is higher with reference to the case

of the hinge 1 with respect to the known one: therefore the stability of the door is guaranteed to a greater extent by the performances of the hinge of the invention.

[0037] On the other hand the door closure is facilitated by it, since the force for releasing the door is lower than what occurs in the prior art, and, as seen before, the force peak is shifted in the two cases resulting in a facilitated closure of the door in the case of the invention.

[0038] Finally it is possible therefore to say that by the performed tests it results that the hinge of the invention has a more uniform and smooth operation than the prior art.

[0039] Such results are achieved by a hinge using elastic means 20 acting only on one of the articulated quadrilaterals of the hinge: in fact, since a lower force has to be exerted in the prevalent part of the rotational movement of the hinge, it is not necessary to have elastic means even at the other quadrilateral, such as on the contrary it occurs with known hinges.

[0040] Therefore it results that the hinge of the invention, as already set forth, is simplified with respect to the known ones as regards this perspective.

[0041] This has advantageous effects as regards manufacturing costs, since the provision of (at least) one spring has been eliminated and even the assembling requires fewer operations, since one less spring has to be fitted.

[0042] From what have been explained so far it is possible to understand how the hinge 1 considered above solves the technical problem set forth hereinbefore for the invention.

[0043] It allows an articulated hinge with a snap opening and closing movement to be manufactured, which is simplified with respect to the known ones while offering equivalent performances.

[0044] Obviously variants of the invention with respect to what described so far are possible.

[0045] For instance, the elastic means 20 can be different than the spring with telescopic enclosure mentioned above, which however has the benefit of being simple and, therefore, inexpensive.

[0046] The spring may be replaced by elastic means made of elastomer (rubber), or can be integrated with a roller arranged at the end and intended to act on the cam profile 24. Other variants can be obtained by modifying the number and/or the shape of the articulated members.

[0047] In this case articulated polygons would be provided and not quadrilaterals as those in the described example: however it is obvious that the results will be the same, provided that elastic means 20 are used only at one of such polygons according to the teaching already explained.

[0048] Further variants of the invention are then shown in figures 11 and 12, which show respective shapes of the previous hinge, with different adjustment systems.

[0049] In particular in the variant of fig. 11 the behaviour of the hinge is adjusted by a screw 30, passing through the head 22 with the cam profile 24: by tightening

or loosening the screw 30, one acts on the spring 20, which is more or less urged.

[0050] Thus the force applied by the spring 20 on the cam profile 24 and the seat 23 changes during the opening and closing phases: however the trend will be similar to that of the diagram of fig.8, but the curve will be translated more upwards or downwards as the screw 30 is tightened to a greater or lesser extent.

[0051] In the variant of figure 12 the adjustment is obtained by a lever 32 arranged at the head 22: by rotating the lever upwards or downwards as shown in (a) and (b) parts of the figure, it changes its interaction with the spring 20.

[0052] In practice the lever 32 carries out the same functions of the screw 30 as in the previous variant, it is just that instead of tightening or loosening the screw in this case it is the lever 32 to be rotated.

[0053] Finally it has to be pointed out only that the principles of the invention set forth above are valid even in the case of hinges having opening angles greater than 90°, for example 120°, 150°, 180° or so on, that therefore will have articulated mechanisms that can be different than the quadrilaterals described above.

[0054] However all these variants fall within the scope of the following claims.

Claims

1. Snap-type hinge for furniture, comprising a first and a second articulated polygons (4, 5, 6, 7; 3, 8, 9, 10), associated to respective plates (2, 3) for fastening on a wall (P) and a door (A) of a piece of furniture and connected to each other in order to allow the door (A) to move with respect to the wall (P), **characterized in that** it comprises elastic means (20) associated to one of the articulated polygons (4, 5, 6, 7; 3, 8, 9, 10) and cooperating therewith for exerting a force in connection with the opening and closing conditions of the door (A), to keep the latter in the opened and closed conditions.
2. Hinge according to claim 1, wherein the force exerted by the elastic means (20) in conditions intermediate between the opening and closing ones of the door (A) is substantially constant and lower than that exerted upon said opening and closing conditions.
3. Hinge according to claims 1 or 2, wherein one of the articulated polygons (4, 5, 6, 7) comprises a cam profile (24) with which the elastic means (20) cooperate for exerting the forces upon the opening and closing conditions of the door (A).
4. Hinge according to claim 3, wherein the cam profile (24) is arranged at a fixed base (4) of the relevant articulated polygon (4, 5, 6, 7).
5. Hinge according to claims 3 or 4, comprising a seat (23) wherein the elastic means (20) engage in connection with one of the opening or closing conditions of the door (A).
6. Hinge according to any of the preceding claims, wherein the articulated polygons (4, 5, 6, 7; 3, 8, 9, 10) are quadrilaterals that comprise each a pair of rocker arms (5, 7; 8, 10), one of which (7; 8) extends beyond the vertex (13) of the relevant quadrilateral thereby forming a connecting rod (6, 9) of the other quadrilateral.
7. Hinge according to any of the preceding claims, wherein the elastic means (20) comprise a spring arranged at a rocker arm (5) of one of the articulated polygons.
8. Hinge according to any of the preceding claims, comprising adjustment means (30, 32) for changing the force exerted by the elastic means (20) in the opening and closing conditions of the door (A).
9. Hinge according to claim 8, wherein the adjustment means comprise a screw (30), a lever (32) or the like, operative into a seat (23) wherein the elastic means (20) engage upon one of the opening or closing conditions of the door (A).
10. Hinge according to any of the preceding claims, wherein the force exerted by the elastic means (20) upon the opening condition of the door (A) is at least twice the one exerted in the conditions intermediate between the opening and closing ones.
11. Hinge according to any of the preceding claims, wherein the change of the force exerted by the elastic means (20) when passing from the opening condition of the door (A) to an intermediate condition, and vice versa, occurs by rotations of the hinge lower than 20°.
12. Hinge according to any of the preceding claims, wherein the force exerted by the elastic means (20) upon the closing condition of the door (A) is greater by 20-50% than that exerted in the conditions intermediate between the opening and closing ones.

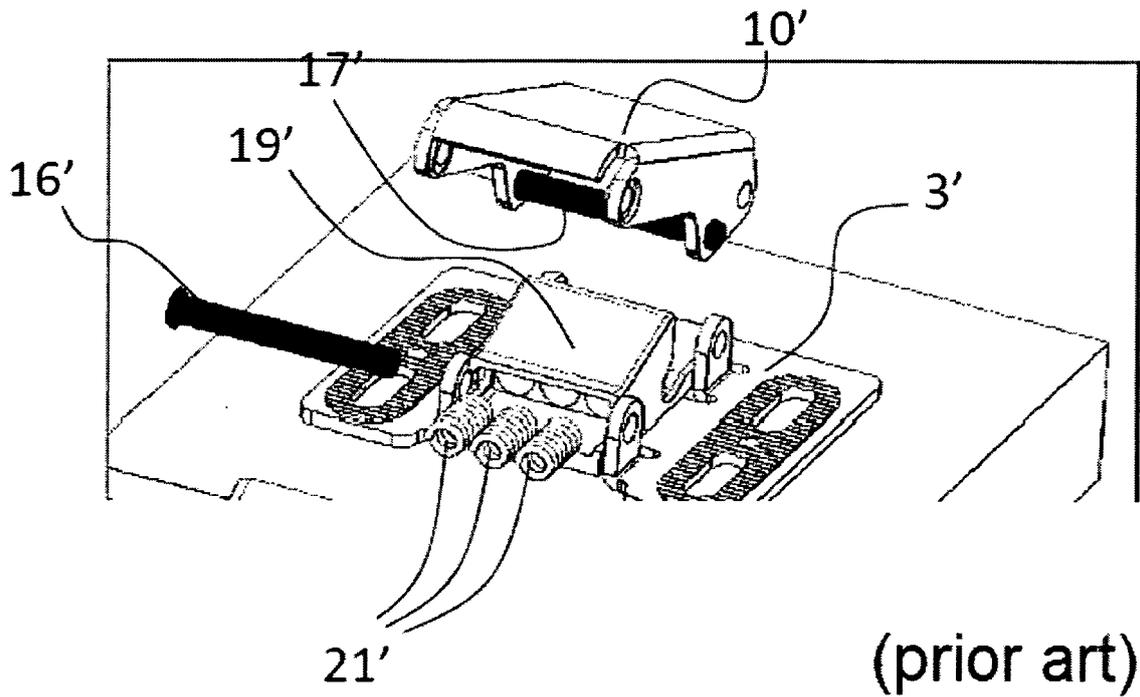
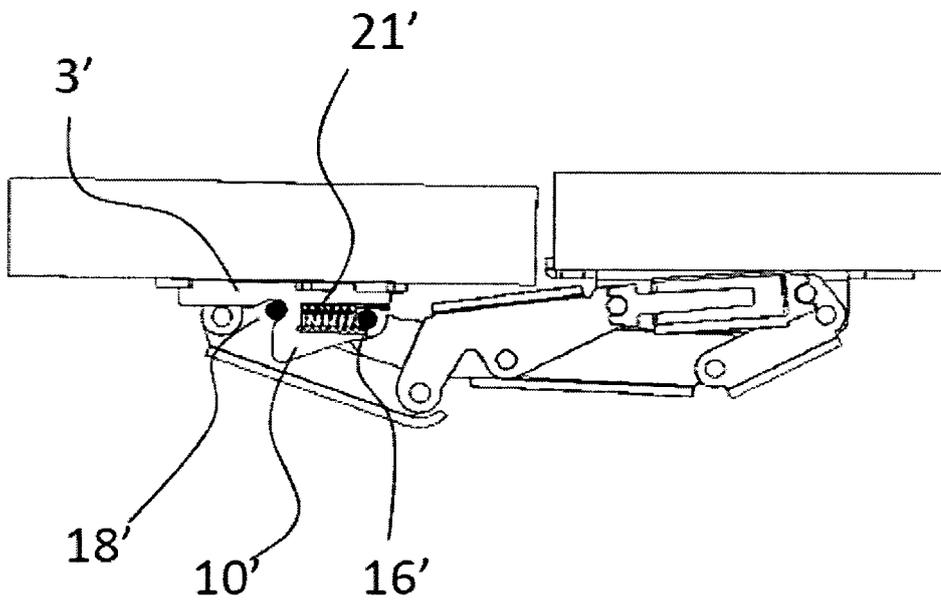


Fig. 1



(prior art)

Fig. 2

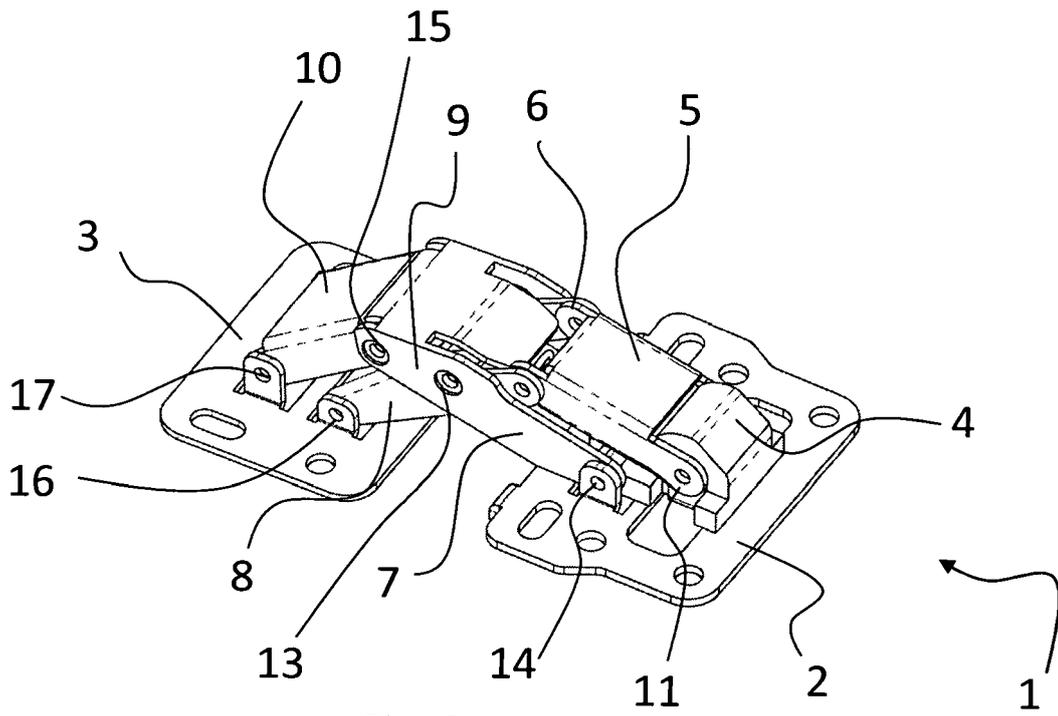


Fig. 3

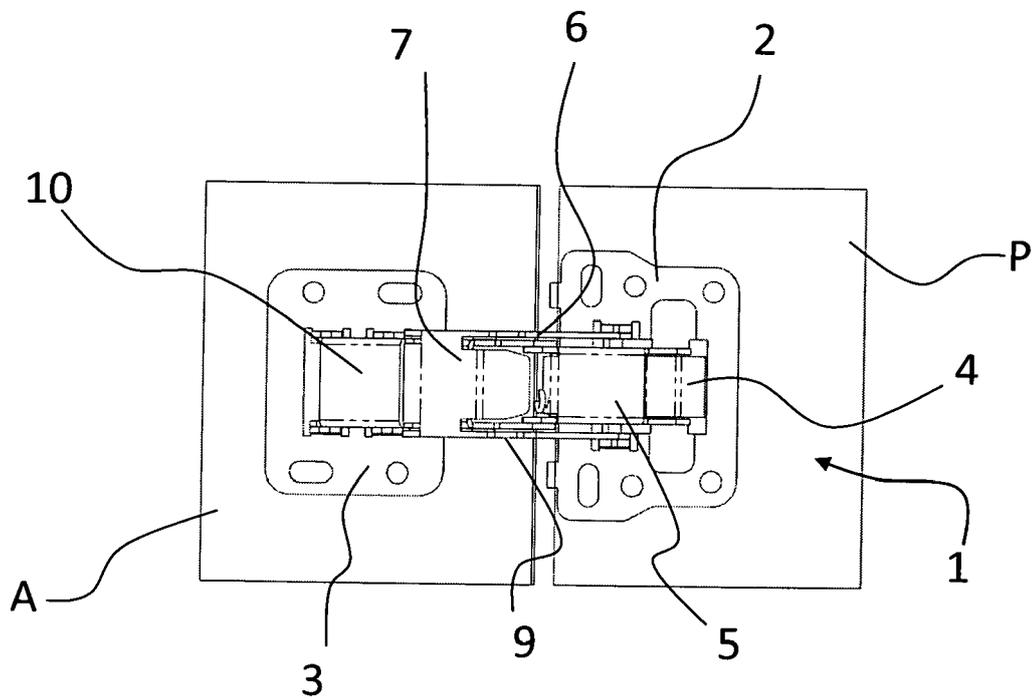


Fig. 4

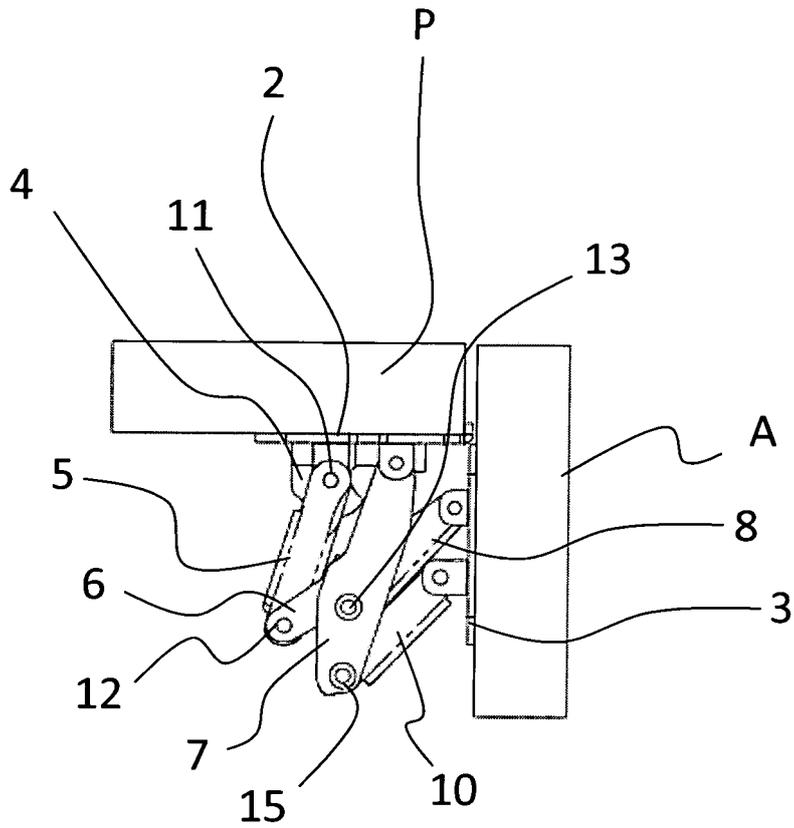


Fig. 5

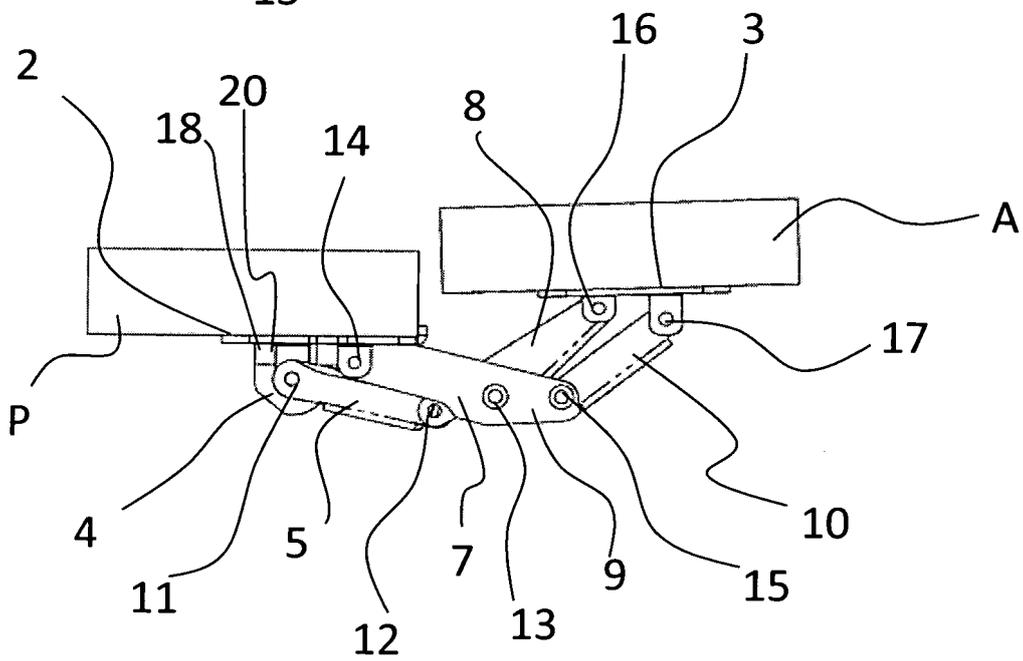


Fig. 6

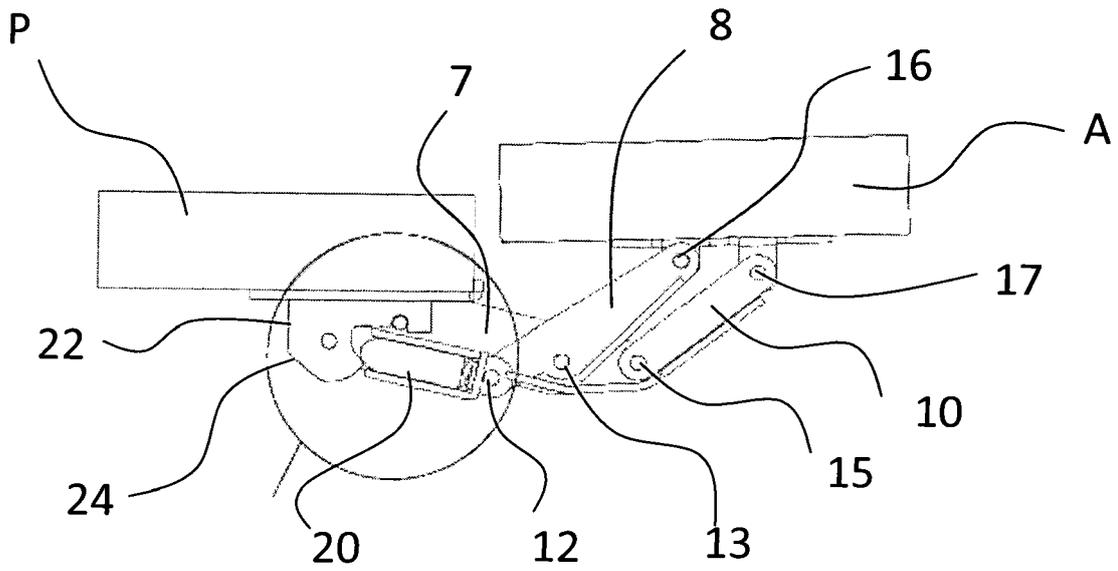


Fig. 7

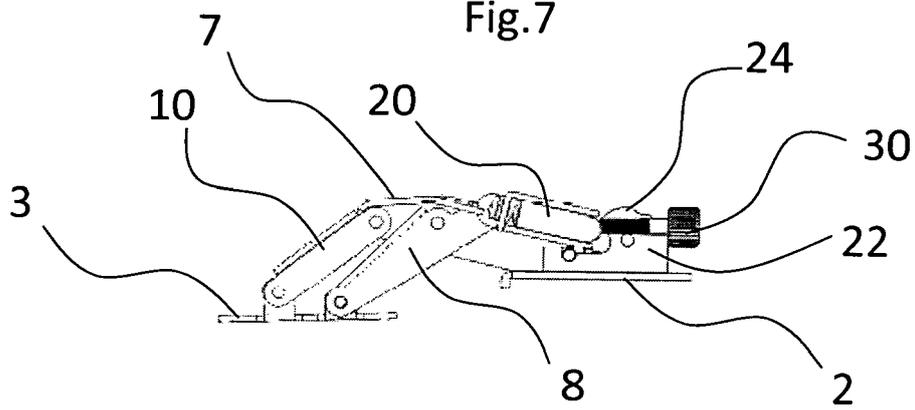


Fig. 11

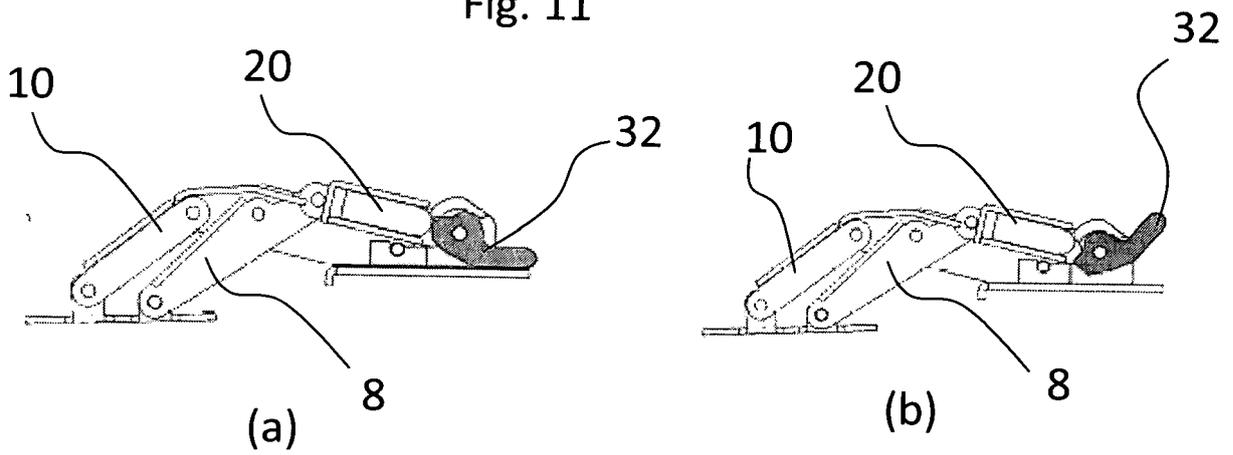


Fig. 12

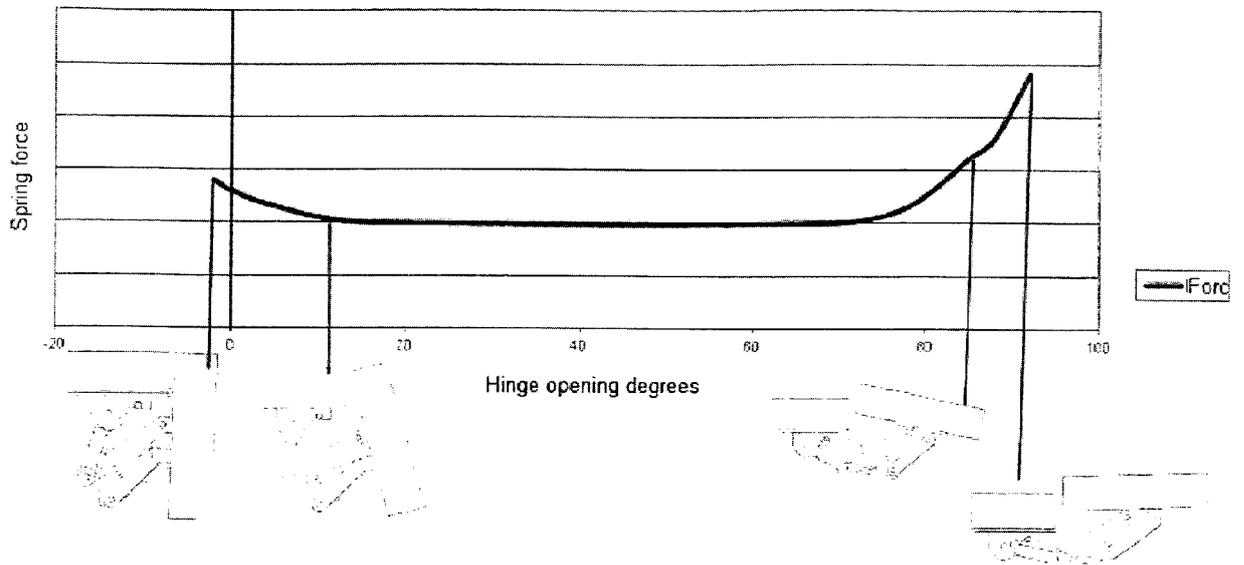


Fig. 8

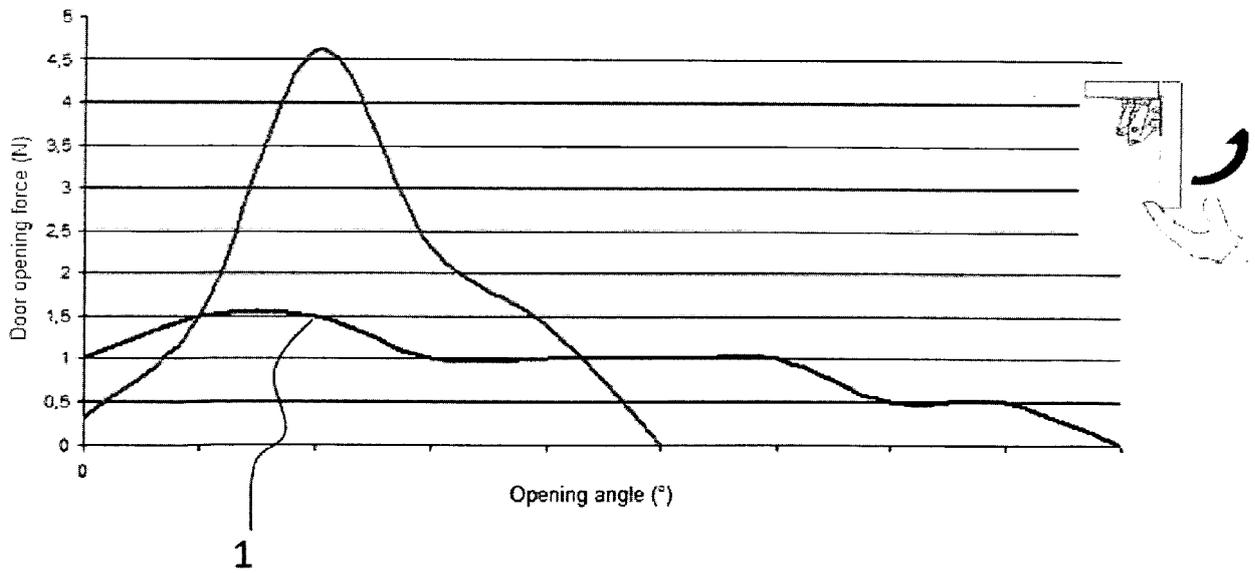


Fig. 9

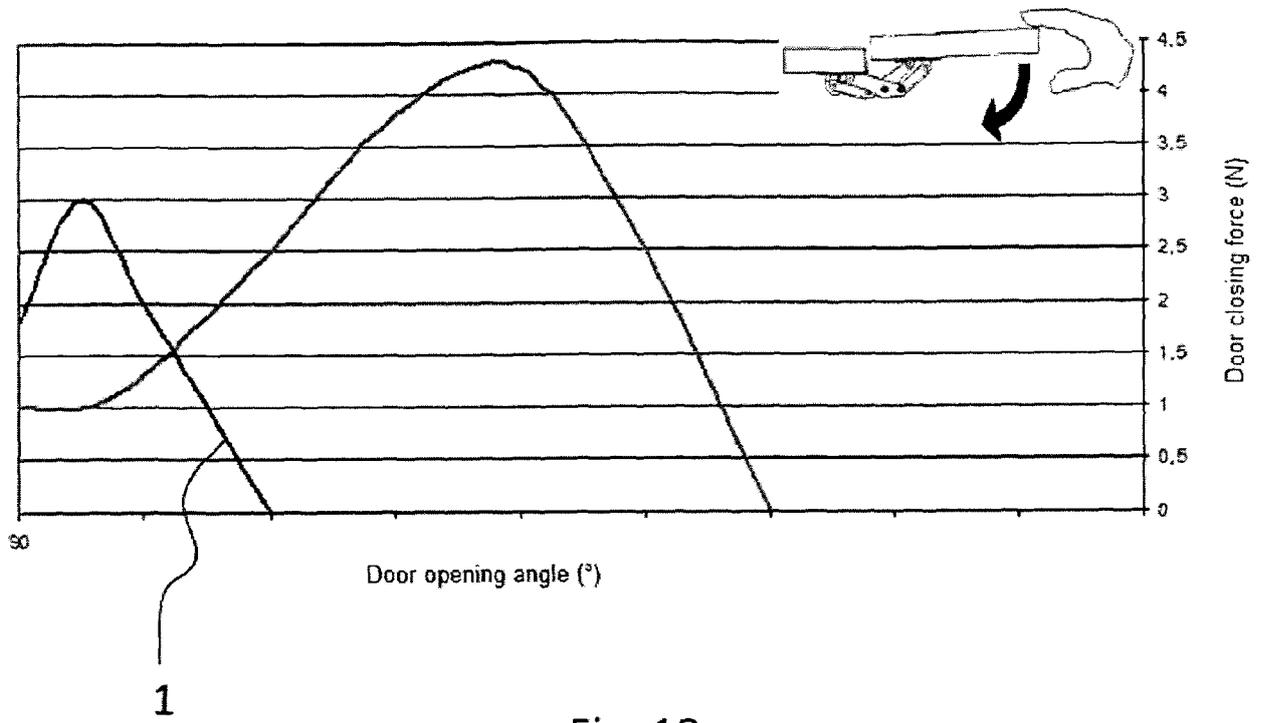


Fig. 10



EUROPEAN SEARCH REPORT

Application Number
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ON EUROPEAN PATENT APPLICATION NO.

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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